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## REMARKS

In the Office Action, claim 25 was objected to. Claims 14 and 25 were rejected under 35 USC §102(b) as being anticipated by Rogers et al. Claims 14-24 were rejected under 35 USC §102(b) as being anticipated by James et al.

The Examiner has deemed the restriction requirement proper and made it final. Applicant believes that both processes, viz. put-down and lift-up, are exact inverse analogues and hence acknowledge that the inventions of Groups I and II are obvious variants.

Both of the inventions concern patterning of thin films of polymer as applied in molecular electronics. The patterning takes place by the use of an elastomer stamp and two process variants which can be considered as inverse analogues are used, namely the first wherein a thin film of polymer is deposited on a surface and a patterned stamp applied to the deposited polymer film and then lifted up to remove a patterned portion of the polymer film corresponding to the pattern given by the stamp surface. In the second variant of the invention a thin film of polymer is applied to the patterned stamp surface and then deposited on the substrate by applying the stamp thereto, thus leaving a patterned thin film of polymer on the substrate after removing the stamp therefrom.

It should not be noted that the first variant depends on the adhesion between the polymer thin film and the stamp surface being greater than between the polymer thin film and the substrate, while the second variant depends on the inverse condition, namely that the adhesion between the stamp surface and the polymer thin film is weaker than the adhesion between the substrate and the polymer thin film. The implication is of course that the adhesion can be modified by either modifying the polymer thin film to have the desired adhesion properties, or in the lift-up variant modifying the substrate, i.e. the material surface to provide a weak adhesion between the surface and the polymer film that is to be lifted up. This modification can take place by plasma etching. Similarly the elastomer stamp surface can be modified to provide a strong adhesion to the polymer film. This modification can take place by modifying the elastomer stamp surface by plasma etching. In the second variant it would be the other way around, namely that the elastomer stamp surface is modified to provide a weak adhesion to the polymer film and this can then again be done by plasma etching. On the other hand the material surface can also be modified to provide a strong adhesion to the polymer film to be transferred thereto and once more this be done by modifying the material surface by plasma etching. Variant 1 and variant 2 are exact inverse analogues and each one is obvious in light of each other.

In the first variant the pattern is formed by lift-up of a polymer thin film, in the second variant by a put-down of the polymer thin film and in both variants by applying a stamp with a patterned surface, conforming to the desired pattern to be created on the surface. The adhesion in variant 1 between the polymer thin film and respectively the stamp surface and the surface to be patterned shall as will be seen exact inverse analogue of the adhesion conditions of variant 2. Moreover it should be noted that claims 2-11 are similar to claims 15-24, a fact that again should be suggestive of the realities of the present invention, namely that the two variants as disclosed by either independent claim 1 or independent claim 14 are exact inverse analogues of each other and each are rendered obvious in light of the other.

Weight should be lent to the fact that the present application was subjected to the International Preliminary Examination in the Chapter II stage of the PCT-procedure, but without a Written Opinion issuing, implying that the Examiner found the application in order with regard to novelty and patentability as well as the unity of the invention. This was also substantiated when the International Preliminary Examination Report (IPER) issued with a reasoned statement under PCT Article 35(2) with regard to novelty, inventive step and industrial applicability that was positive in regard of claims 1-25, similar to those also on file in the U.S. A copy of the IPER is enclosed.

Claims 14 and 25 are rejected as being anticipated by Rogers et al in a paper published in Advanced Materials (1999), Vol. 11, No. 9, pp. 741-745. Rogers et al does not disclose microcontact printing of thin films of polymer at all, but a conventional procedure for printing gold electrodes on an insulating substrate. Thereafter respectively a semiconducting polymer and a dielectric polymer forming a gate insulator were successively applied over the top of the microcontact-printed gold electrodes, for instance by casting. It should be noted that dependent claim 25 of the present invention which is a claim of use concerns forming an etch resist by microcontact-printing a thin film of polymer onto a gold layer.

The Examiner has also rejected the claims 14-24 as being anticipated by James et al. in Langmuir (1998), vol. 14, pp. 741-744. Herein James et al teaches a microcontact printing of patterned protocol in layers of solid substrates. This cannot be regarded as relevant for the present invention which is not concerned with protein layers at all, but rather with obtaining patterns in conventional insulating or conjugated polymers as used in molecular electronics. As well-known in the art poly(dimethylsiloxane) (PDMS) (stamps) are hydrohobic as stated in James et al, page 742. This makes such stamps less practical when aqueous protein solutions shall be applied and printed onto a substrate. However, the stamp surface can temporarily be made

hydrophilic by a low-temperature plasma treatment, but this of course has no bearing on the adhesion between the substrate and the polymer as is the case of the present invention. The present invention on the contrary teaches plasma etching to increase or decrease the adhesion, but we are unable to find this feature disclosed in James et al and that is contrary to the Examiner's assertion. However, as the Examiner quite rightly says, James teaches microcontact printing of patterns in layers with the protein dissolved to form a water-bases biological solution which of course then is applied as "ink" to the stamp. It should be noted that the experimental section of James et al particularly sets forth that the technique is used for microcontact printing of a layer of dye-conjugated polylysine, in casu polylysine hydrobromide with a molecular weight of 37600 g/mol, the lysine hydrobromide basic unit thus having a molecular weight of about 209. In other words, the polymerized group contains about 180 molecules of the amino acid base in its bromide form.

This can be compared with the experimental section of the present invention which is concerned with the patterning of PEDOT-PSS either by lift-up or put-down. Finally it should be noted that James et al teaches the patterning of protein onto substrates, and with micrometer-scale features, but this is not borne out by the text, unless "mm" is a misprint for μm. The present invention as applied in molecular electronics anyway shall allow the printing of

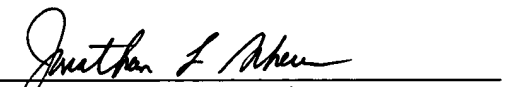
patterns in thin film in polymer in the micrometer range, although is should be noted that the microcontact patterning or other soft lithography methods now common are applied to provide feature sizes in the nanometer range. Also a central problem as discussed in James et al is of course that the use of large stamps and the wide spacings between the features create sagging problems, which is overcome by specially made stamps. In the present invention a relief-patterned stamp is applied to conformal contact with the substrate surface and its elastic properties allow the application of the present invention to provide patterns on uneven or curved surfaces, but then of course it should be kept in mind that the features in the present application for the use and as applied in molecular electronics would be in the micrometer range, and may also in this respect deviate from the patterned protein layers of James et al.

Based on the foregoing amendments and remarks, it is respectfully submitted that the claims in the present application, as they now stand, patentably distinguish over the references cited and applied by the Examiner and are, therefore, in condition for allowance. A Notice of Allowance is in order, and such favorable action and reconsideration are respectfully requested.

However, if after reviewing the above amendments and remarks, the Examiner has any questions or comments, he is cordially invited to contact the undersigned attorneys.

Respectfully submitted,

JACOBSON HOLMAN, PLLC

By: 

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# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

| Applicant's or agent's file reference | FOR FURTHER ACTION | See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) |
|---|---|---|
| Opti45PCT | | |
| International application No. | International filing date *(day/month/year)* | Priority date *(day/month/year)* |
| PCT/NO00/00157 | 12/05/2000 | 12/05/1999 |
| International Patent Classification (IPC) or national classification and IPC<br>G03F7/00 | | |
| Applicant<br>THINFILM ELECTRONICS ASA et al. | | |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

| Date of submission of the demand | Date of completion of this report |
|---|---|
| 12/12/2000 | 05.04.2001 |
| Name and mailing address of the international preliminary examining authority:<br>European Patent Office<br>D-80298 Munich<br>Tel. +49 89 2399 - 0 Tx: 523656 epmu d<br>Fax: +49 89 2399 - 4465 | Authorized officer<br>Randez Garcia, F<br>Telephone No. +49 89 2399 2234 |

Form PCT/IPEA/409 (cover sheet) (January 1994)

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/NO00/00157

I. Basis of the report

1. With regard to the elements of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
**Description, pages:**

1-12 as originally filed

**Claims, No.:**

1-25 as originally filed

**Drawings, sheets:**

1/1 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

| | | | |
|---|---|---|---|
| Novelty (N) | Yes: | Claims | 1-25 |
| | No: | Claims | |
| Inventive step (IS) | Yes: | Claims | 1-25 |
| | No: | Claims | |
| Industrial applicability (IA) | Yes: | Claims | 1-25 |
| | No: | Claims | |

2. Citations and explanations
**see separate sheet**

Re Item V

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1). The documents cited in the Search Report do not disclose patterning polymers on material surfaces.

2). Thus, US-A-5512131 discloses a process wherein a chemical species capable of forming a self-assembled monolayer is coated onto the stamping surface of an elastomeric stamp, said species having a functional group selected to bind to a particular material. The stamping surface is placed against a surface of a material surface and removed to leave a self-assembled monolayer of the species according to the stamping surface pattern of the stamp. See in particular, from col. 5, line 60, to col. 6, line 14, and fig. 1. This document does not suggest that a polymeric species could be used as the chemical species capable of forming a self-assembled monolayer (see col. 12, lines 10-53).

3). Therefore, the methods of claims 1, 14 and 25 for patterning a polymer film on a material surface cannot be anticipated or rendered obvious by the documents considered.

4). Claims 2-13 on the one hand, and 15-24 on the other hand, relate to modifications of the new and inventive subject-matter disclosed in claims 1 and 14, respectively. Therefore, claims 1-25 meet the requirements of Article 33(2) and (3) PCT.